

THAT WHICH IS CLAIMED IS:

1. A multi-mode integrated circuit (IC) for operating in an ISO mode in accordance with International Standards Organization 7816 (ISO 7816) protocol, and a non-ISO mode in accordance with a non-ISO protocol, the multi-mode IC comprising:
 - a microprocessor;
 - an external interface connected to the microprocessor and comprising
- 10 a voltage supply pad,
- a ground pad,
- a first set of pads in accordance with the ISO 7816 protocol, and
- a second set of pads in accordance with the non-ISO protocol; and
- 15 a mode configuration circuit connected to the switching block for configuring the multi-mode IC in one of the ISO mode and the non-ISO mode based upon a signal on one pad of the first set of pads.

2. A multi-mode IC according to Claim 1 wherein the mode configuration circuit configures the multi-mode IC to operate in one of the ISO and non-ISO modes while disabling the other of the ISO and non-ISO modes.
- 5

3. A multi-mode IC according to Claim 2 wherein the first set of pads is disabled when the multi-mode IC is configured in the non-ISO mode, and the second set of pads is disabled when the multi-mode IC is configured in the ISO mode.
- 5

4. A multi-mode IC according to Claim 1 wherein the mode configuration circuit comprises:

CONFIDENTIAL

a mode detector connected to the one pad of the first set of pads; and

a latching circuit connected to the microprocessor and receiving an output from the mode detector.

5. A multi-mode IC according to Claim 4 further comprising a control register connected to the latching circuit for storing a mode configuration indicator.

6. A multi-mode IC according to Claim '4 further comprising a voltage detector connected to the voltage supply pad to detect a voltage supply of one of the ISO and non-ISO modes.

7. A multi-mode IC according to Claim 4 wherein the non-ISO mode comprises a Universal Serial Bus (USB) mode, and the second set of pads includes D-plus and D-minus pads in accordance with the USB protocol; and further comprising a USB cable detector connected to the D-plus and D-minus pads.

8. A multi-mode IC according to Claim 4 wherein the first set of pads includes a clock pad, a reset pad, and an input/output pad in accordance with the ISO 7816 protocol.

9. A multi-mode IC according to Claim 4 wherein the first set of pads includes a clock pad, a reset pad, a variable supply voltage pad, and an input/output pad in accordance with the ISO 7816 protocol; and wherein the mode detector comprises a pull-up resistor connected to the one pad of the first set of pads.

10. A multi-mode smart card for operating in an ISO mode in accordance with International Standards Organization 7816 (ISO 7816) protocol, and a non-ISO mode in accordance with a non-ISO protocol, the
5 multi-mode smart card comprising:
a card body; and
a multi-mode integrated circuit (IC) carried by the card body and comprising
an external interface including
10 a voltage supply pad,
a ground pad,
a first set of pads in accordance with the ISO 7816 protocol, and
a second set of pads in accordance
15 with the non-ISO protocol, and
a mode configuration circuit for configuring the multi-mode IC in one of the ISO mode and the non-ISO mode and comprising
a mode detector connected to one pad
20 of the first set of pads, and
a latching circuit connected to the mode detector.

11. A multi-mode smart card according to Claim 10 further comprising a control register connected to the latching circuit for storing a mode configuration indicator.

12. A multi-mode smart card according to Claim 10 further comprising a voltage detector connected to the voltage supply pad to detect a voltage supply of one of the ISO and non-ISO modes.

00000000000000000000000000000000

13. A multi-mode smart card according to Claim 10 wherein the non-ISO mode comprises a Universal Serial Bus (USB) mode, and the second set of pads includes D-plus and D-minus pads in accordance with the USB protocol; and further comprising a USB cable detector connected to the D-plus and D-minus pads.

14. A multi-mode smart card according to Claim 10 wherein the mode configuration circuit configures the multi-mode IC to operate in one of the ISO and non-ISO modes while disabling the other of the ISO 5 and non-ISO modes.

15. A multi-mode smart card according to Claim 14 wherein the first set of pads is disabled when the multi-mode IC is configured in the non-ISO mode, and the second set of pads is disabled when the multi-
5 mode IC is configured in the ISO mode.

16. A multi-mode smart card according to Claim 10 wherein the first set of pads includes a clock pad, a reset pad, and an input/output pad in accordance with the ISO 7816 protocol.

17. A multi-mode smart card according to Claim 10 wherein the first set of pads includes a clock pad, a reset pad, a variable supply voltage pad, and an input/output pad in accordance with the ISO 7816 protocol; and wherein the mode detector comprises a pull-up resistor connected to the one pad of the first set of pads.

18. A multi-mode smart card system for operating in an ISO mode in accordance with International Standards Organization 7816 (ISO 7816)

protocol, and a non-ISO mode in accordance with a non-ISO protocol, the multi-mode smart card system comprising:

5 a multi-mode smart card comprising
 an external interface including
 a voltage supply pad,
 a ground pad,
 a first set of pads in accordance with
 the ISO 7816 protocol, and
10 a second set of pads in accordance
 with the non-ISO protocol, and
 a mode configuration circuit for
 configuring the multi-mode smart card in one of
 the ISO mode and the non-ISO mode and comprising
15 a mode detector connected to one pad
 of the first set of pads, and
 a latching circuit connected to the
 mode detector; and
 a non-ISO-compliant smart card reader for
20 reading the multi-mode smart card including
 a smart card interface having a plurality
 of contacts for respectively mating with the
 voltage supply pad, the ground pad, and the
 second set of pads in accordance with the non-
25 ISO protocol, and
 a mode indication circuit for connection to
 the one pad of the first set of pads for
 providing a non-ISO mode indication signal to
 the mode detector of the mode configuration
30 circuit.

19. A multi-mode smart card system according to Claim 18 wherein the mode configuration circuit further comprises a control register connected to the latching circuit for storing a mode configuration

indicator.

20. A multi-mode smart card system according to
Claim 18 wherein the mode configuration circuit
further comprises a voltage detector connected to the
voltage supply pad to detect a voltage supply of one
5 of the ISO and non-ISO modes.

21. A multi-mode smart card system according to
Claim 18 wherein the non-ISO mode comprises a
Universal Serial Bus (USB) mode, and the second set
of pads includes D-plus and D-minus pads in
5 accordance with the USB protocol.

22. A multi-mode smart card system according to
Claim 18 wherein the mode configuration circuit
configures the multi-mode IC to operate in one of the
ISO and non-ISO modes while disabling the other of
5 the ISO and non-ISO modes.

23. A multi-mode smart card system according to
Claim 22 wherein the first set of pads is disabled
when the multi-mode IC is configured in the non-ISO
mode, and the second set of pads is disabled when the
5 multi-mode IC is configured in the ISO mode.

24. A multi-mode smart card system according to Claim 18 wherein the first set of pads includes a clock pad, a reset pad, and an input/output pad in accordance with the ISO 7816 protocol.

25. A multi-mode smart card system according to Claim 18 wherein the first set of pads includes a clock pad, a reset pad, a variable supply voltage pad, and an input/output pad in accordance with the

ISO 7816 protocol; and wherein the mode detector comprises a pull-up resistor connected to the one pad of the first set of pads.

26. A method of operating a multi-mode integrated circuit (IC) in an ISO mode in accordance with International Standards Organization 7816 (ISO 7816) protocol, and a non-ISO mode in accordance with 5 a non-ISO protocol, the multi-mode IC including an external interface having a voltage supply pad, a ground pad, a first set of pads in accordance with the ISO protocol, and a second set of pads in accordance with the non-ISO protocol, the method 10 comprising:

detecting whether one of an ISO-mode condition and a non-ISO-mode condition exists on one pad of the first set of pads;

15 configuring the multi-mode IC in the ISO mode and disabling the second set of pads when the ISO-mode condition is detected; and

configuring the multi-mode IC in the non-ISO mode and disabling the first set of pads when the non-ISO-mode condition is detected.

27. A method according to Claim 26 wherein detecting whether one of the ISO-mode condition and the non-ISO-mode condition exists on the one pad of the first set of pads comprises detecting whether 5 one of the ISO-mode condition and the non-ISO-mode condition exists during a power-on-reset of the multi-mode IC.

28. A method according to Claim 26 further comprising verifying the non-ISO mode, when the non-ISO-mode condition is detected, by detecting a non-

ISO-mode voltage on the voltage supply pad.

29. A method according to Claim 26 wherein the first set of pads comprises a reset pad, a clock pad and an input/output pad in accordance with the ISO 7816 protocol.

30. A method according to Claim 29 wherein detecting whether the ISO-mode or non-ISO-mode condition exists comprises detecting if a signal from one of an ISO-compliant interface and a non-ISO-
5 compliant interface is present on the clock pad.

31. A method according to Claim 26 wherein the first set of pads includes a clock pad, a reset pad, a variable supply voltage pad, and an input/output pad in accordance with the ISO 7816 protocol.

32. A method according to Claim 26 wherein the non-ISO protocol comprises a Universal Serial Bus (USB) protocol.

33. A method according to Claim 26 further comprising storing a mode configuration indicator for indicating whether the multi-mode IC is configured in the ISO or non-ISO mode.

卷之三